1991

Barrier Islands

Felicia West Ed.D.

David Wallace

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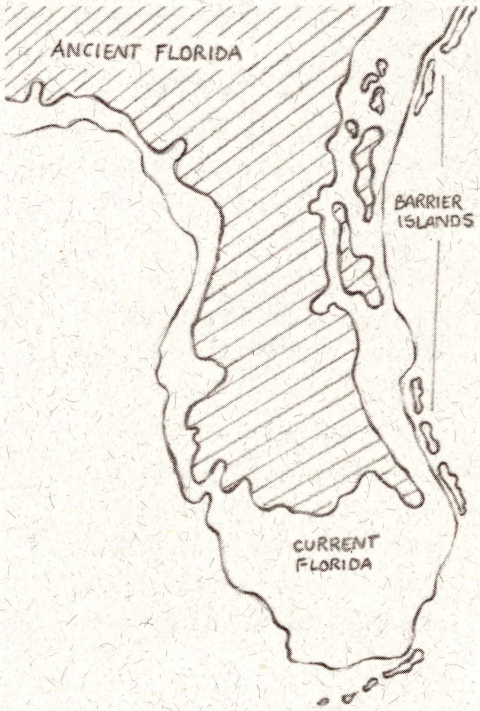
by Felicia West, Ed.D.

Edited by Joan Bray and Teri Rosen
Illustrated by David Wallace

BARRIER ISLANDS

For most of us, the beach suggests sun, fun, sand, heat, tanned bodies and the coconut smell of suntan lotion. But the next time you go to Little Talbot Island or Anastasia Island, take a look at the surroundings. Look beyond the cars, the booming stereos, and the game of beach volleyball, to the beach itself – the water and the land and the vegetation. Look past the dunes, across the highway, past the trees to the salt marsh. What you see is a barrier island.

Barrier islands are long fingers of sand, separated from the mainland by bays, sounds or lagoons. Such islands protect estuaries such as the St. Johns River estuary from the ocean waves. These islands may be up to a dozen or so miles long and a mile or so wide. They are often located on either side of an inlet. For example, on one side of Little Talbot Island is Fort George Inlet and on the other are two tidal creeks and Nassau Sound.

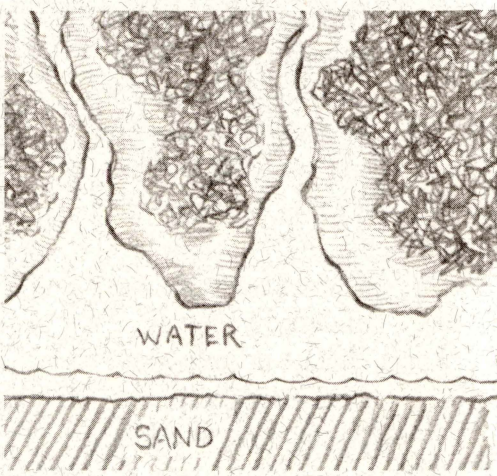


These small islands undergo constant change as they are continuously hit by ocean waves. Barrier

islands are the product of erosion, transportation and deposition. The same forces that create them can change or destroy them. Storms, tides and winds affect them day after day. They sometimes bring or remove sand and sometimes blow sand overland to the salt marshes behind the island.

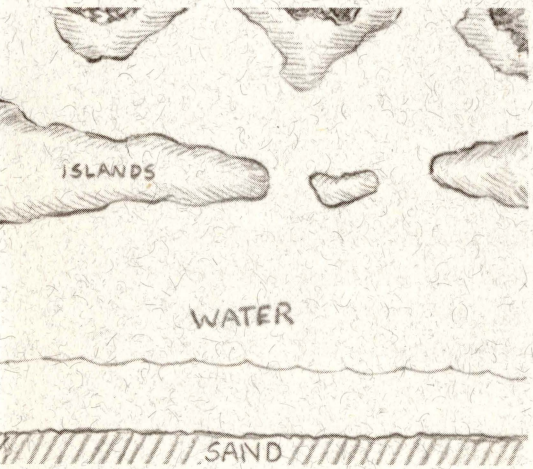
FORMATION OF A BARRIER ISLAND

Geologists have suggested two ways in which barrier islands may form. According to the spit theory, a barrier island forms when a strip of land, or spit, gets cut off from the headland by a heavy tide or a storm surge. As the headlands erode, sediments drift and form a long sand finger stretching away from the headland. As the spit grows in length, it



may stretch across a bay or lagoon, eventually enclosing it. As the sand continues to drift, the spit will grow until it runs into land or the sand source runs out. As inlets form, the spit becomes an island or a series of islands.

According to the drowned beach ridge theory, barrier islands are formed by the rising and falling of sea level. When the glaciers melted for the last time, sea level rose rapidly until about 5,000-6000 years ago. Then sea level rise slowed to about its present rate. The coastal plain of that time was being rapidly eroded, and the rivers flowing across the plain were loaded with sediments. River valleys indented the coastal plain of Florida at the time of the melting. Dune ridges formed on what was then the coastal plain of our mainland. The rising seas flooded the low-lands behind, forming the broad, shallow lagoons of the Florida coast.



As sea level has continued to rise, the dunes have moved or migrated toward land. They are still migrating. Our barrier beaches of today are those sand ridges of yesterday. Some scientists believe that the Jacksonville Beaches probably formed fifty or sixty miles off our current coastline. When sea level rise slowed, the migration

slowed. Some islands stopped migrating altogether. Sand was in great supply from the rapidly eroding uplands. Over time, the islands widened and became desirable places to build homes. Since sea level has begun to increase its rate of rise, this period of no migration for the islands has come to an end.

We see evidence of this migration on Jacksonville's beaches. Fossilized shells of invertebrate animals that lived in salt marshes are constantly washed up on our beaches. We find oyster shells, for example, on the beach at Little Talbot Island. Oysters do not thrive on the open ocean side of an island, but on the back side in the salt marshes. At the north end of Little Talbot Island, heavy surf removes the sand to uncover ancient marsh bottom. This migration, or shifting, is what you may know as "beach erosion." While beaches will always exist, we can depend on the sand to shift so that the size and location of our beaches will change. The beach in front of your house today may one day be behind it.

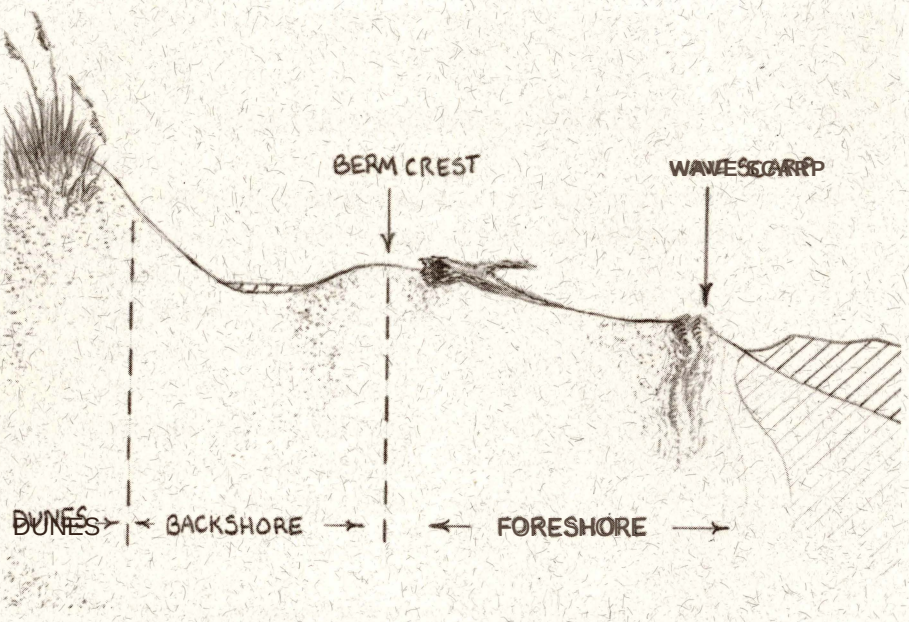
STRUCTURE OF BARRIER ISLANDS

The structures making up a barrier island include the intertidal ocean beaches, dunes, barrier flats, intertidal salt marshes and flats. Their size may be different from one island to another and from time to time on the same island. **Remember:** These islands undergo constant change.

OCEAN BEACHES

The beach is the sandy part of land where waves hit. Geologists define a beach as the area on the ocean front where the sand keeps moving because of the waves.

The three areas of beaches are the nearshore, foreshore and backshore. The near shore contains sand in the form of ridges separated by troughs. When a wave breaks on the near shore, it comes in as a swash of sandy water. The water and sand are returned to deeper water as an outgoing current below the surface known as the wash. Since much of the wave energy of the swash is spent on the beach, the wash is a calmer flow of water.



A small wave scarp marks the beginning of the foreshore, and rises to the berm crest, which is usually the highest part of the beach. This part of the beach is built up by sand brought ashore by turbulent wave action as the waves break on shore. The beach then slopes downward toward the first row of dunes. This lower portion of the upper beach is the backshore.

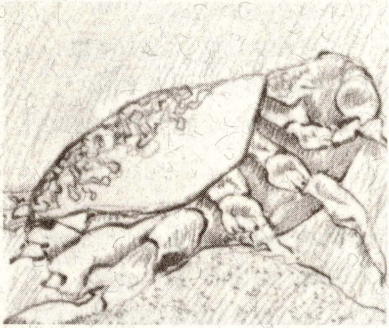
The presence and size of these structures vary from day to day, season to season. During the summer, gentle southeast and southwest winds help form wide beaches that are slightly steeper. When the high waves of winter break on the beach, sand is carried offshore into deeper water. The beach narrows and the slope becomes gentler. The gentler slope allows the beach to absorb more of the wave energy and reduce erosion. This natural process tends to stabilize beaches if humans do not interfere.

The beach is not a good environment for many kinds of living things. The sand is in constant motion from the action of the wind and waves. Animals and plants that need to be in water cannot live here because the beach is dry part of the time. And animals and plants that need to be in air cannot live here because the beach is covered with water part of the time.

Living things do survive in the sands of the beach, though. Many of them are microscopic and live in the spaces between the tiny grains of sand. The green tint you sometimes see on patches of damp sand is due to microscopic plants on the surface of the sand. Microscopic animals also live in the damp beach sand.

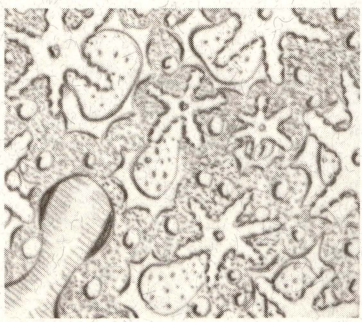
The swash zone, where water moves up the beach from the breaking surf, is home to a number of animals. The thin sheet of water moving up the beach from the breaking surf

carries food up the beach. Some of the food is microscopic plants and animals. Some is detritus, or bits of decaying plant and animal material. Filter feeders sift these tiny food particles from the water. The primary filter feeders on our beaches are coquina clams, small mollusks that ride the swash up and down the beach. They have a film of mucus on their gills to trap tiny food morsels. Cilia, or tiny hairs, then sweep the food to their mouths.



Mole crabs also live in this zone where waves break on the sand. They are not true crabs, but are closely related to crabs. They feed on microscopic particles trapped by their feathery antennae. Surf fishermen often capture mole crabs for bait.

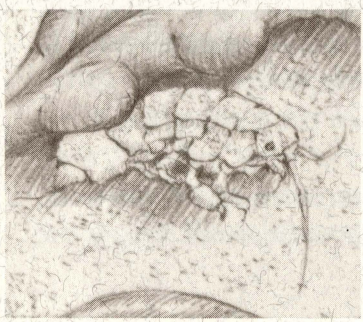
Dense worm populations also live on many of our southeastern coasts. If you watch quietly, you can see tiny razor clams bury themselves in the soft beach sand as the tide moves over the shore. Sea pansies thrive in calm seas and clear water. They look like purple mushrooms, supported on thin, somewhat flexible stalks. If you examine one carefully, you will find that it is a colony of animals, rather than just one individual. Sea pansies are related to corals.



Many small fish, such as juvenile pompano and whiting, follow the waves in to the beach. Sometimes they become trapped in sloughs until the next high tide. Blue crabs lurk just beyond the surf zone to feed on any dead or dying fish. On rare occasions in our area, you can find a horseshoe crab, which is more closely related to spiders than to true crabs.

Sometimes animals from deeper water are carried onto the beach. The most bothersome are jellyfish and Portuguese man-of-war. If you brush against their tentacles, you will feel a severe burning.

In the upper intertidal area, life abounds in material deposited during the high tides. Small arthropods known as beach fleas can survive on the deposits of plant material.



Just above the high tide mark in the soft sand are many burrows, all displaying an apron of sand. These are the homes of ghost crabs, grayish-white crabs that are normally nocturnal. They are the vacuum cleaners of the beach, scavengers that eat any

of the rotting plant and animal debris found on the beach. They prey on the tiny coquina clam, crushing it, eating the soft parts, and tossing away the shell.

Many birds visit the beach to feed. Some eat flying insects. Others feed on the clams, beach fleas, mole crabs and small fish. These shorebirds include sandpipers, plovers, gulls and terns. Just off the north shore of Little Talbot Island, somewhat blocking the entrance to Nassau Sound, is Bird Island. This is a large sandbar, known as an important breeding and roosting site for many birds. Some thirty-three species of birds inhabit the sea beach and the nearby shallow ocean habitat. Many of these birds feed on clams and crabs. Others feed on fish, insects, fruits and seeds as well as dead plant and animal material deposited on the shore.

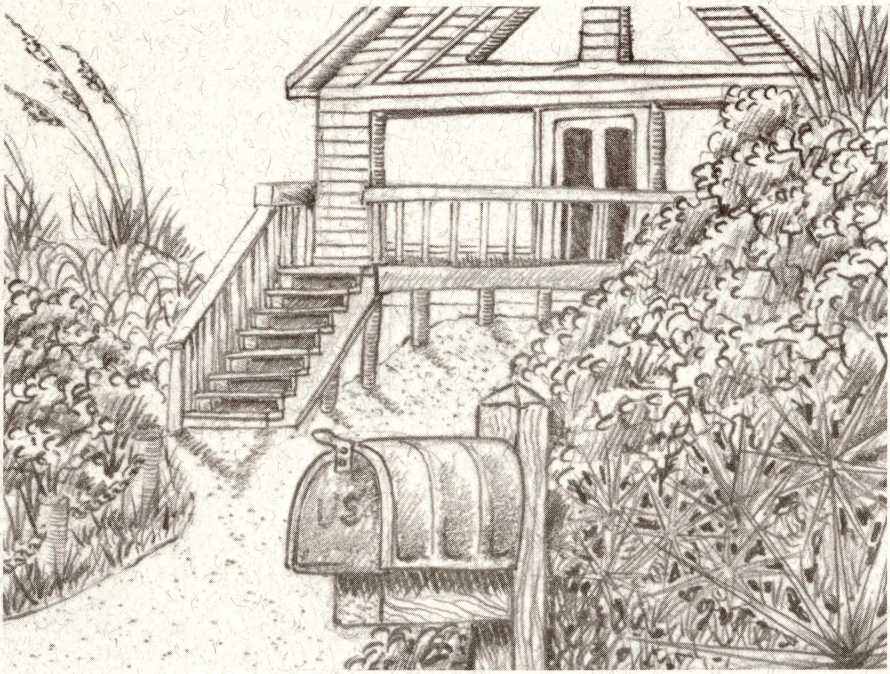
In addition to humans, a number of other mammals come to the beach. Rats, mice, raccoons and opossums hunt for

food a short distance into the sea beach habitat. Moles, rabbits and mice all feed in the sand dune areas where sea oats are present. Burrows made by gopher tortoises, who prefer high and dry areas, and ghost crabs are frequent in the dune area. Some of these burrows are used by mice. Several species of sea turtles use the soft sands of the upper beaches and fore dunes as breeding grounds. Opossums, raccoons and sometimes humans eat their eggs.

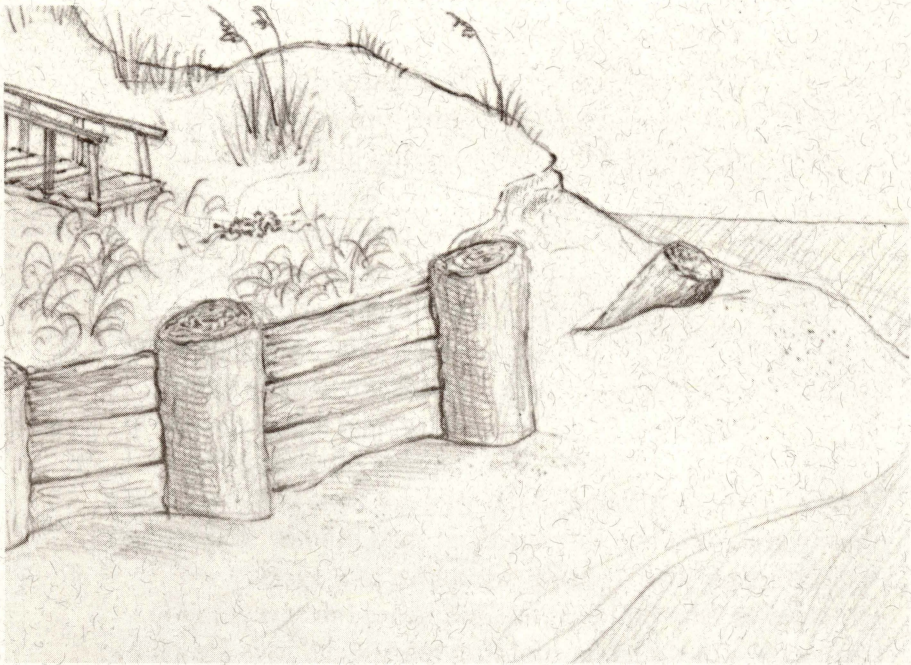
DUNES

The dunes of the barrier beach are natural, ocean-facing piles of wind-blown sand. Dunes are affected by wave erosion, and they protect the island's interior. Dunes are also highly prized as homesites for people. Dunes prevent flooding by high storm tides, absorb the impact of incoming waves, and serve as a

source of sand during periods of erosion. The sand is carried out to deep water and helps to maintain a more gentle slope on the beach.



As long as the dunes protect the inner island from salt spray, grasses and shrubs will give way to forested areas. When people tamper with the dunes, the interior of the island is more likely to be hit by ocean storm surges or spring tides. When islands are left without permanent roads and buildings, beaches and dunes shift without alarming anyone. Whether buildings are on the dunes or not, sand responds to the wind and wave actions of nature.



The ocean constantly battles the beach and dunes, which must shift constantly as the sea assaults them. People cannot stop or control the battle. If we are to save our beaches, we must stay out of nature's way.

DUNE ECOLOGY

On the seaward side of the dune live pioneer plants that can survive in a most severe habitat. They are drenched by fresh rain water and baked by the sun. These plants can exist in the "spray zone," where salt spray evaporates from the leaves of the plants, leaving a white deposit of salt. The tiny salt crystals act as magnifying glasses, focusing the sun's rays and burning the plant leaves. Heavy winds

constantly shift the sands, sometimes completely burying the tiny plants.

The plants that do survive in this area are usually grasses, succulents or low-lying vines. The leaves on these plants are usually shiny, waxy, and salt resistant, capable of storing fresh water. One plant found in this pioneer zone is the sea oat, a hardy grass that is a very efficient sand binder. The sea oat is a tall grass with a strong, extensive root system. It tolerates sand buildup well and is used in revegetation projects. Vines such as morning glories and low-growing plants such as sea rocket and beach berry also help to catch and anchor the shifting sands of the backshore and the foredune areas. These plants form mats on the open beach seaward of the dunes themselves. Other plants such as sea purslane have fleshy, succulent leaves that store water to help them survive in this pioneer zone.

The foredunes are important dry habitats. Animals who can live only in this habitat, such as the gopher tortoise, are said to be ecologically restricted. The island glass lizard found on these barrier islands is restricted to this habitat also. The gopher tortoise is significant in this environment. Its deep burrows help soil develop and give shelter to other small animals. Unfortunately, development on many barrier islands is removing the high, dry habitat of the glass lizard and the small lizard may soon be an endangered species.

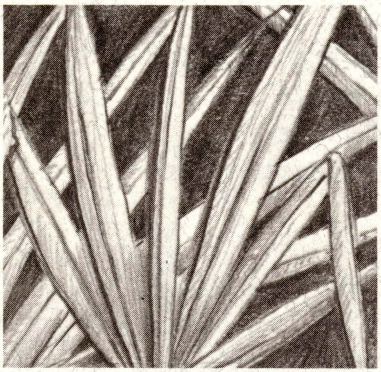
Farther away from the beach, dunes have become stabilized by plant roots. With less salt and more organic material in the soil, woody plants are able to grow. This is the beginning of a scrub zone of vegetation. The soil cannot yet support forest growth and the plants must still survive in a rather severe environment. The plants are low and scrubby and are pruned by the winds and salt spray from the ocean. Saw palmetto, spanish bayonet, and wax myrtle are found here. Prickly pear cactus is another plant that grows among the scrub. Some plants that grow to be trees in more favor-

able environments are just shrubs here. Oaks look like little bushes, and magnolias spread out like shrubs. Sometimes the larger plants are nearly covered by the shifting sands and only the very tops are visible.

The wax myrtle is an evergreen shrub living in the scrub zone as well as marsh borders and forests. Its waxy gray berries can be harvested in the fall. These are the bayberries often used in candle making. Prickly-pear cactus has flattened, spiny padlike "leaves" that are really modified stems. Its delicate flower is bright golden yellow, but the plant has bristles and spines that can poke your legs and feet. Ilex vomitoria or yaupon grows to be a tree in more favorable environments, but in the dune area it is often a shrub. The plant gets its name from a "black tea" made from its leaves that can induce vomiting.

Reindeer lichen or reindeer moss grows on the back side of the dunes. These lichens form a common ground cover in scrub on the backs of dunes. They become soft and sponge-like in wet periods and crisp and brittle when dry.

Still farther inland, the scrub gives way to a forest zone. Old dunes have been stabilized and enough organic material is present so that a forest can grow. The area is now



protected from salt spray, and fresh water tends to collect in low areas between the lines of older dunes. Many of the trees are pines, but in well protected areas live oaks, magnolias, and cabbage palms may grow. If dune fields are young and narrow, and are not protected from the sea, forests may not grow.

The cabbage palm is the official state tree of Florida. It grows in coastal sites, dunes and patches of hardwood trees along the Atlantic Coast. On Little Talbot Island some palms are thriving on the fore dune itself.

Southern magnolia can grow as a shrubby plant on the dune or a large tree in the forest area. In the dune area, it may appear as a sprawling shrub because the lower part of its trunk has been buried by shifting sands. Redbay is also found throughout North Florida. Its leaves are aromatic when crushed. Southern red cedar, too, is plentiful on the islands in Nassau and Duval Counties. It produces a small, waxy, gray-blue "juniper berry."

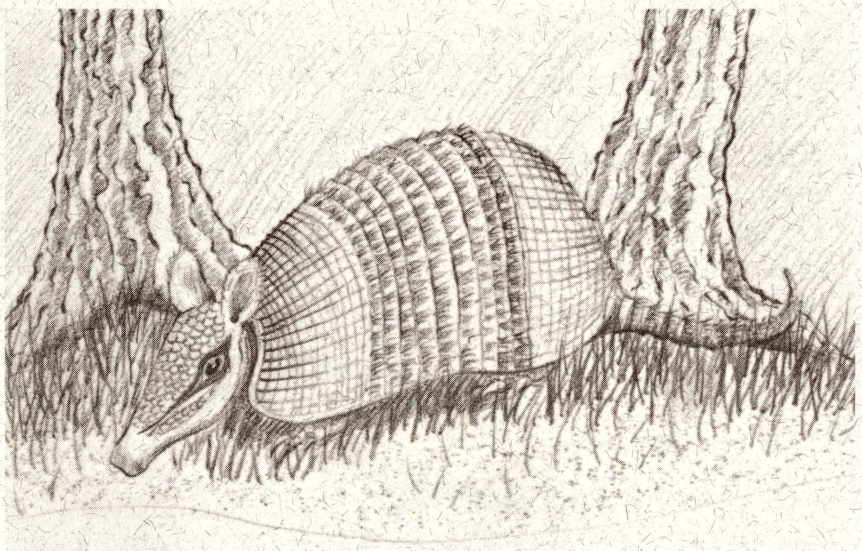
The low areas between the dunes may contain enough fresh water to support various turtle species, snakes, newts and frogs. Some species, such as salamanders, tree frogs, and some toads, may temporarily depend on fresh water, but they are not restricted to that habitat.

The higher and drier dune formations, with their sea oats and other vegetation, provide food and cover for a number of birds. Herbivorous insects provide food for the doves, mockingbirds, wrens, warblers and sparrows populating this area.

Many birds live in the scrub and forest zones. Doves, sparrows and mockingbirds are some of the common ones. In the forest you may see blue jays, woodpeckers, tufted titmice and cardinals. Some of these birds eat insects, while others feed on fruits and seeds. Owls and hawks prey on snakes, amphibians and small mammals such as mice.

Mammals also live in the scrub and forest zones. Some are seed eaters and some eat the smaller animals that eat the

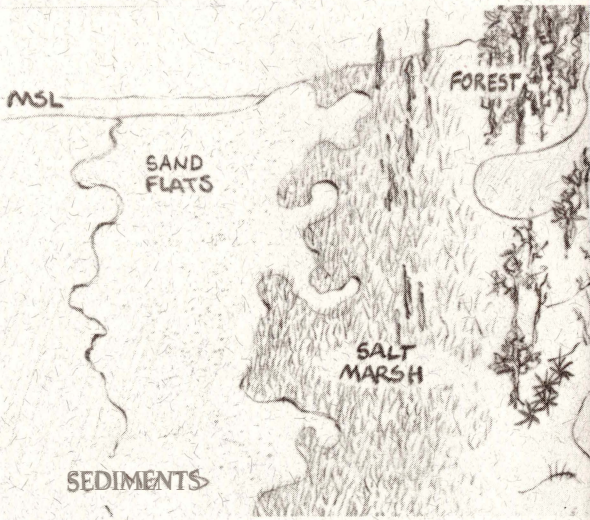
seeds and fruits. Mammals are secretive and not easy to see on these islands. Opossums, raccoons, rats, mice and squirrels live in the scrub and in the forest. Bobcats are occasionally found on some of the less inhabited islands, along with foxes, armadillos, and an occasional panther. Deer could live on the larger islands if hunting were restricted.



BARRIER FLATS

Our southern barrier islands are mostly broad, low, and flat with a dune zone bordering the ocean. Sometimes storm tides wash through passes in the dunes and flood the flats behind them. Behind the dune is either a flat grassy area or one grading into low shrubs and finally into forests. On low-lying islands, overwash from storms or spring tides

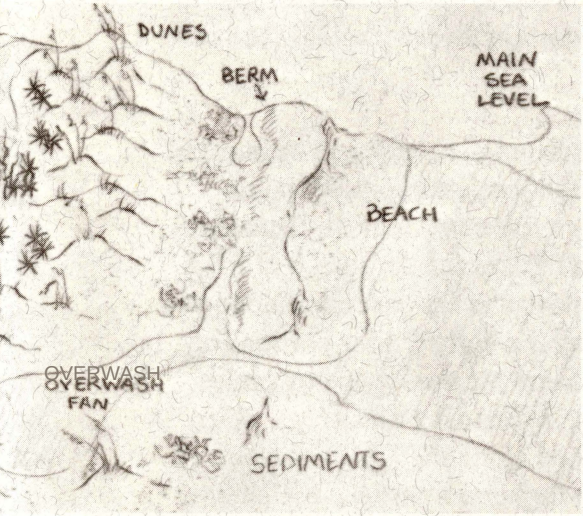
may carry sand through the passes and create a flat, grassy plain. As overwash from storms deposits sand, grasses from below quickly stabilize the new layers. If the sand is not stabilized by grasses, the wind will add it to the dunes. If water stops invading the flats, shrubs and other woody plants move in and forests develop. The flats serve as a barrier to overwash waters from storm surges or spring tides. By the time such heavy seas have crossed the dune and passed over the flats, they gently enter the bay or lagoon, causing little or no damage.



SALT MARSHES

On the back side of most barrier islands, where beach-building wave action is absent, the land slips gently into the quiet water of the salt marsh. Salt marshes are the back side habitat of most of our barrier islands. They are flooded by tides, some regularly, some irregularly, depending on how high they are. Scientists consider salt marshes to be among the most productive ecosystems on earth. The main plants here are rushes and cordgrass, often called by its scientific name, Spartina. The black needle rush has

round leaves with sharply pointed tips. It gives a brownish gray appearance to vast stretches of the salt marsh. Cordgrass is bright green. It lives in the portions of the marsh that get flooded most often. Many other smaller plants also grow in the marshes.



Salt marshes are classified as low marshes or high marshes. Low marshes are flooded by every high tide. High marshes are flooded only during spring tides and storms. Because the low marsh is flooded regularly with every high tide, it is the more productive of the two, helping support the food chain in the lagoon behind the barrier island. Organic peat develops in the floor of the marsh, and the grasses trap nutritious sediment in the water. As marshes fill in with sediment, they become less productive. Nature corrects the problem by creating new marshes through overwash and inlet formation.

Many kinds of animals live at least part of their lives in salt marshes. The salt marsh is sometimes called a nursery for fish and shrimp. Oysters, clams

and mussels live in the salt marsh. Fiddler crabs live in burrows and scurry across the mud at low tide. Insects – pesky mosquitoes and flies, and plant-eating beetles and grasshoppers – are abundant. Many birds come to eat the insects and to fish in the marshes. Egrets and gulls come to the marshes to fish and catch crabs. Ducks dive for fish in the deeper water of the creeks that thread through the salt marshes.

Some tidal wetland reptiles spend their entire lives in marsh habitats. The carolina diamondback terrapin, found on Amelia Island, is restricted to this environment. Diamondback rattlesnakes come into the marshes in search of food. You can see the tracks of opossums and raccoons along the edges of a salt marsh. Along the higher, drier portions of the marsh, you may detect some burrows made by moles. Marsh rabbits feed along the upper drier areas also. Rats, mice and skunks look for food along the higher margins of the marsh while otter range farther out into the marshes.

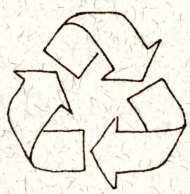
NEED FOR PROTECTION

This booklet is an introduction to the barrier islands of Northeast Florida. By now you should realize that coastal habitats are very fragile. In this harsh environment, plants that are destroyed have a hard time coming back. The land itself may be lost to wind or wave action. Very few kinds of plants are suited to the harsh environment of barrier islands. Protection of existing plants is essential if animals – and the islands themselves – are to survive.

People can destroy dune plants on dune buggies, automobiles, motorcycles, and even on foot. Damaged dunes can be restored and replanted, but it costs much less to protect the existing systems.

Find out what YOU can do to help protect these fragile environments!

THE END



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